

single brood in a year and that the adult parasite emerges when the host larvae are present in the field. Since particularly the entire host pupa had been eaten up by the parasite larva and only insignificant part of the host pupal covering was left in the cocoon, it is evident that the parasite larva pupates after consuming the host pupa.

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## 21. PRELIMINARY STUDIES ON THE BIOLOGY OF *GRAPTOSTETHUS* SP. (LYGAEIDAE, HEMIPTERA) FEEDING ON STUBBLES OF SANNHEMP

Fletcher (1914)<sup>1</sup> reported *Graptostethus servus* Fabr., for the first time in India. The nymphs and adults were reported by him to feed on red gram, sweet potato and jute capsules.

During March 1966 large numbers of nymphs and adults, of *Graptostethus* sp. were found feeding on the stubbles of Sannhemp at

<sup>1</sup> FLETCHER, T. B. (1914): Some South Indian Insects and other animals of importance, pp. 482. Govt. Press, Madras.

the R. A. K. Agriculture College, Sehore, M. P. farm, and the biology of the pest was studied.

*Mating:*

Mating end to end occurred soon after emergence of adults. A single act of copulation took a maximum of 150 minutes and a minimum of 20 minutes. Females mate several times during their life time.

*Preoviposition and Oviposition:*

Eggs are laid on the seeds singly and rarely in clusters of 3 to 5. If the male dies, the egg laying capacity of the female decreases but on release of a fresh male with the female the fecundity increases.

The total number of eggs laid by a female varied from 46 to 136. The oviposition period ranged from 4 days in April upto 9 days in March. Maximum number of eggs laid by a single female in a day was 28.

TABLE I  
OVIPOSITION PERIOD AND FECUNDITY OF *Graptostethus* sp.

Month	Oviposition period (in days)	No. of eggs laid by a female
March 1966	9	136
April 1966	4	46

*Incubation period and hatching:*

The incubation period ranged from 3 to 7 days. The pinkish colour of the egg darkened at the time of hatching. A few hours before hatching a reddish point developed at the anterior end of the egg indicating the presence of head and compound eyes. During hatching the egg shell opened out at the anterior end allowing a lid-like portion of the egg to separate out. First the head of the larval nymph emerges followed by the rest of the body. The whole sequence of hatching was completed within 10-12 minutes. The percentage viability of the eggs varied from 74 to 89.

*Nymphal instars:*

The developmental periods of five nymphal instars were 3, 3, 2 to 3, 3 to 4 and 3 to 5 days respectively. The total duration of nymphal period ranged from 15 to 17 days both in males and females,

TABLE 2

INCUBATION PERIOD AND PER CENT VIABILITY OF EGGS OF *Graptostethus* sp.

Date of egg laying	No. of eggs under observation	Date of hatching	No. of eggs hatched	Incubation period (in days)	per cent viability		
25-iii-66	100	29-iii-66 30-iii-66 31-iii-66 1-iv-66	57 13 9 7	4-7	86		
			86				
30-iii-66	100	2-iv-66 3-iv-66	59 15			3-4	74
			74				
3-iv-66	100	8-iv-66 9-iv-66	69 18	5-6	87		
			87				
15-iv-66	100	20-iv-66 21-iv-66	73 16	5-6	89		
			89				

TABLE 3

DURATION OF NYMPHAL PERIOD

Date of hatching	Date of 1st moult	Date of 2nd moult	Date of 3rd moult	Date of 4th moult	Date of 5th moult	Nymphal period (in days)
31-iii-66	3-iv-66	6-iv-66	8-iv-66	12-iv-66	15-iv-66	15
3-iv-66	6-iv-66	9-iv-66	12-iv-66	15-iv-66	20-iv-66	17

*Life cycle and longevity of adults:*

The period required for one life cycle varied from 17 to 24 days. The longevity of male and female adults with food varied from 3 to 4 and 6 to 11 days respectively.

TABLE 4

LIFE CYCLE PERIOD AND LONGEVITY OF ADULTS

Date of egg laying	Date of hatching	Incubation period (in days)	Date of formation of adult	Nymph. period (in days)	Total period for life cycle	Date of mortality	Longevity in days
25-iii-66	1-iv-66	7	18-iv-66	17	24	♂ 22-iv-66	4
						♀ 24-iv-66	6
27-iii-66	30-iii-66	3	16-iv-66	17	20	♂ 20-iv-66	4
						♀ 27-iv-66	11
30-iii-66	2-iv-66	3	16-iv-66	14	17	♂ 19-iv-66	3
						♀ 24-iv-66	8

## DESCRIPTION OF LIFE HISTORY STAGES

**Egg**

Average of 10 eggs—length 0.99 mm., breadth 0.52 mm. Elongate, colour uniformly pinkish.

**Nymph**

**First Instar:** Average of 10 nymphs—length 1.28 mm. breadth 0.49 mm. Freshly hatched nymph uniformly faint yellow, with head, eyes, legs and antennae brownish. Antenna four segmented, the distal segment pinkish in colour. Brownish spots on the thoracic region. Three red stripes on the dorsum of the abdomen one located in the centre and two on lateral sides of the abdomen. Hair all over the body.

**Second Instar:** Average of 10 nymphs—length 2.20 mm., breadth 1.15 mm. Body colour similar to that of first instar nymph. Red irregular spots appear in between the red stripes on the dorsal part of the abdomen.

**Third Instar:** Average of 10 nymphs—length 2.39 mm., breadth 1.15 mm. The colour of the head, eyes, antennae and legs become blackish brown. Head and thorax well sclerotized. Red stripes of the abdomen become prominent. Irregular red dots continue. Abdomen pale yellow. Two black spots develop on the central red stripe, first on the tergites of 4th and 5th and second on tergites of 5th and 6th abdominal segments towards their posterior part. Anal end black.

TABLE 5

MEASUREMENTS OF VARIOUS DEVELOPMENTAL STAGES OF *Graptostethus* sp. IN MM.

Stage	Variations in		Average	
	Length (mm.)	breadth (mm.)	Length (mm.)	breadth (mm.)
Egg	0.99-1.10	0.52-0.55	0.99	0.52
First Instar	0.90-1.22	0.42-0.54	1.28	0.49
Second "	1.80-2.34	0.83-1.33	2.20	1.15
Third "	2.16-2.70	1.00-1.44	2.39	1.15
Fourth "	2.95-3.60	1.62-1.80	3.82	1.66
Fifth "	5.00-6.00	2.50-4.50	5.24	3.13

**Fourth Instar:** Average of 10 nymphs—length 3.82 mm., breadth 1.66 mm. Body colour darkens. The two black spots become prominent. Wing pad starts developing, extending up to half of the

first abdominal segment. A white line develops in the centre running longitudinally on the dorsal part of the abdomen bisecting it.

**Fifth Instar:** Average of 10 nymphs—length 5.24 mm., breadth 3.13 mm. Body colour further darkens. Head thorax and legs well sclerotized, wing pads extended up to second abdominal segment.

### **Adult**

Average of 10 adults—length 5.85 mm., width across the wings 3.38 mm. Body colour greyish brown or smoky. Antennae, mouth parts and legs black. Antennae four segmented, pronotum small, Mesonotum largest with black spots, Scutellum black.

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## 22. EARTHWORM CASTS AS A SOURCE OF MUD FOR THE CONSTRUCTION OF NEST BY SPHECID WASP

In the Malabar Christian College compound, when the authors were engaged in the collection of certain insects, an unidentified Sphecid wasp, about an inch in length was found frequenting a spot on the ground in the area. On closer examination, it was found that it was hovering around the earthworm casts. It landed on a few casts, apparently 'testing' the consistency or suitability of the mud and finally settled down on a particular cast. A small bit of mud was then bitten off with the mandibles and was beautifully kneaded into a spherical mass, about a quarter of an inch in diameter. The wasp then flew away, carrying the mass of mud with the help of the anterior two pairs of legs. It was naturally inferred that the wasp was using this mud for the construction of its mud-nest.